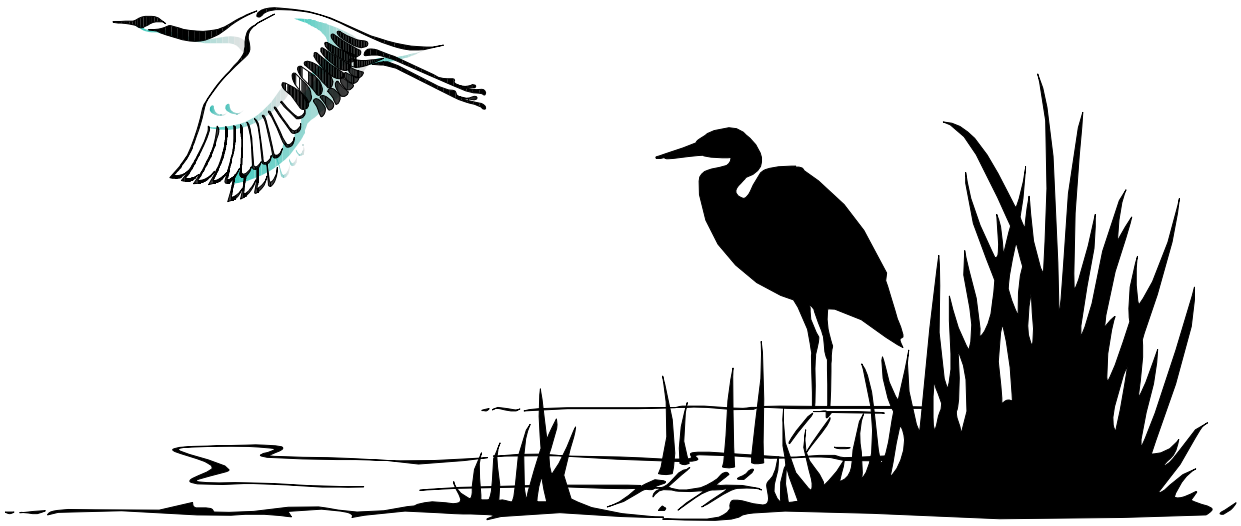
Fish Kill Investigation:
West Fork White River
I-465 and Thompson Road
Indianapolis, Indiana
August 5, 1999

Indiana Department of Environmental Management



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INTRODUCTION

On the morning of August 5, 1999, Dave Daugherty, Office of Emergency Response, Indiana Department of Environmental Management (IDEM), notified Steve Boswell, Surveys Section, Assessment Branch of the Office of Water Management, IDEM, about a fish kill in the White River at Thompson Road and I-465. Initial estimates were that about 20-30 perch had died.

This fish kill occurred at the end of a two week period in which much of Indiana and the Midwest had in excess of 90^{O}F daily high temperatures. According to the State Climatologist=s World Wide Web home page, the average high temperature was 92^{O}F between July 20 and August 2, 1999. The lowest high temperature was recorded at 87^{O}F, and the highest high was 97^{O}F. Also according to the State Climatologist=s World Wide Web Home Page on July 30-August 3, 1999 the Indianapolis area experienced partial cloud covering. During this period there was also a total of 1.19 inches of rainfall. Of this total, 0.95 inch fell within the first two days of the period.

METHODS

Surveys Section personnel arrived on the scene at 12:15 PM on August 5, 1999, to further investigate the possible reason for the fish kill. The area containing the dead fish was defined by visual observation. The location of the fish kill was transcribed to an electronic topographical map, and has been included in this report as Figure 1.

A count of all dead fish was made. Physical characteristics of the fish were noted to help identify the species of the fish and to determine the decomposition rates of the individual fish.

A Hydrolab Scout ™ multi-meter was used to measure field parameters in the pool and selected sites upstream and downstream of the pool. Field parameters collected included: Dissolved Oxygen (D.O.), Temperature, pH, Turbidity, Conductivity, Total Dissolved Solids, and Percent Saturation of D.O. The Hydrolab was calibrated in the IDEM laboratory on August 2, 1999 for D.O., pH, and Conductivity.

RESULTS

The pool containing the dead fish was located at river mile 224. This is two river miles downstream of the Stout Generating Facility Dam, as indicated on Figure 1. It is directly beneath the I-465 bridge just off of Thompson Road on the east side of the river. The pool was formed by a large gravel bar that extended from the north side of the I-465 bridge to about 60 feet south of the bridge. The river was at low flow or about five times $Q_7$10 or 345 cubic feet per second (cfs). Water going into this pool came mainly from Haueisen Ditch located at the upper portion of the pool. Also on the upper end of the pool, opposite of Haueisen Ditch, there was an opening from the main channel of the river. It did not appear to contribute significant flow to the pool at the time of investigation. During periods of higher flow, the river would provide the majority of the flow into the pool. The upstream end of the pool was the deepest and widest part at the time of investigation. It was about

2**2**-3 feet deep and about 30 feet wide. This area is completely shaded by the I-465 bridge. The remainder of the pool south of the bridge is about 65-70 feet long and becomes increasingly narrow and shallow. Of the 65-70 feet in this pool, an algal mat covered about 40-50 feet. The downstream end of the pool at the time of investigation was about 8 feet wide and had no more than an inch of water flowing through it.

The physical count of dead fish showed 47 individuals in varying states of decomposition. The fish appeared to have died over a period of about 1-3 days. The fish were identified as river carpsuckers and highfin carpsuckers. All but one were 10-15 inches long. Four fish with open sores were observed swimming disoriented near the surface of the pool, which indicated they were highly stressed. Other areas upstream and downstream of the pool had fish without any apparent stress related problems.

Hydrolab readings were taken in five locations that represented critical areas above, below, and within the pool. The specific sites listed in order of sampling are: the mouth of Haueisen Ditch, upstream of the pool in the main channel of the White River, the upstream portion of the pool, the downstream portion of the pool, and downstream of the pool in the main channel of the White River. All the parameters except the percent saturation of D.O. were normal for this time of the year (Table 1). The percent saturation of D.O. readings were all greater than 100%. Water with D.O. saturation readings greater than 100% is said to be supersaturated.

The gaging station records for the White River on the day of sampling and five days prior were obtained from the USGS real time World Wide Web site. Table 2 displays the general trends of the river flow in cfs. This table reveals a steady reduction of flow from July 31st to August 4th. On August 5th, the flow increased to the level similar to the August 1st and 2nd values.

DISCUSSION

The four fish that were observed swimming in a disoriented manner and having open sores on their bodies are an indication of poor water quality in the pool. Open sores are usually an indication of an infection, caused by bacteria, parasites, or viruses. An infection can come about any time, but a fish is more vulnerable during periods of high stress. In stressful conditions, the fish do not produce a normal slime coat. The slime coat acts as the primary defense like a human=s skin. As the slime coat thins or disappear, the pathogens can enter into the fish=s system easier.

Observing the supersaturation is important because it may indicate a possible large diurnal fluctuation of D.O. Because the rising and setting of the sun, diurnal fluctuations of D.O. takes place in every body of water that supports submerged plant life. During daylight hours plants are photosynthesizing, producing oxygen as a by-product. This activity increases the D.O. concentration in the water. Once the sun stops shining photosynthesis stops. In return plants consume oxygen through respiration.
Supersaturation is normal in a nutrient rich body of water. The surplus nutrients support excessive

plant growth, usually planktonic algae. This algae when not limited by light will produce more oxygen than the water should be able to hold. The concentrations of D.O. that water can hold vary depending on the physical conditions associated with the water. Temperature, atmospheric pressure, and salinity are a few examples of the physical parameters that effect the solubility of oxygen into water. Atmospheric pressure and salinity are irrelevant to this situation. Temperature is very important in the warm weather months of summer, because the warmer the water; the less D.O. it can hold.

The problem occurs when there is not enough light to maintain photosynthesis. Lowered light levels can be a result of nighttime hours combined with several overcast days in a row. When the light levels are not intense enough over an extended period of time there could be a massive algal die off. As the dead plant materials accumulate on the bottom anaerobic bacteria begins decomposing the dead plants. The anaerobic decomposition of the organic matter places a serious demand on the dissolved oxygen concentrations. When there are several days without adequate light for photosynthesis, the D.O. concentrations may be unable to support aquatic life.

CONCLUSIONS

Both species of carpsuckers are schooling fish which explains the concentration of the two species in the small pool. Due to their size they probably could not pass the riffle area after the river levels started to fall. This trapped them in the pool. The several days in a row of partial cloud cover, July 30- August 3, 1999, could have been a reason for an algal die off. Respiration and anaerobic decay of the algal material depleted the dissolved oxygen in the water. When the dissolved oxygen levels dropped too low, the fish either died directly from asphyxiation or days later due to disease outbreaks caused by stress associated with low concentrations of dissolved oxygen. The first group of fish to die, appeared to do so because of the lack of oxygen. The fish that were dying over the next couple of days were probably a result of the infections caused by the extreme stress of being exposed to oxygen depleted waters. Using best professional judgement, the fish kill was determined to be caused from the inability of the fish to leave the shallow pool that contained a low level of dissolved oxygen.

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FIGURE 1 Map Locating Area of Fish kill Investigation

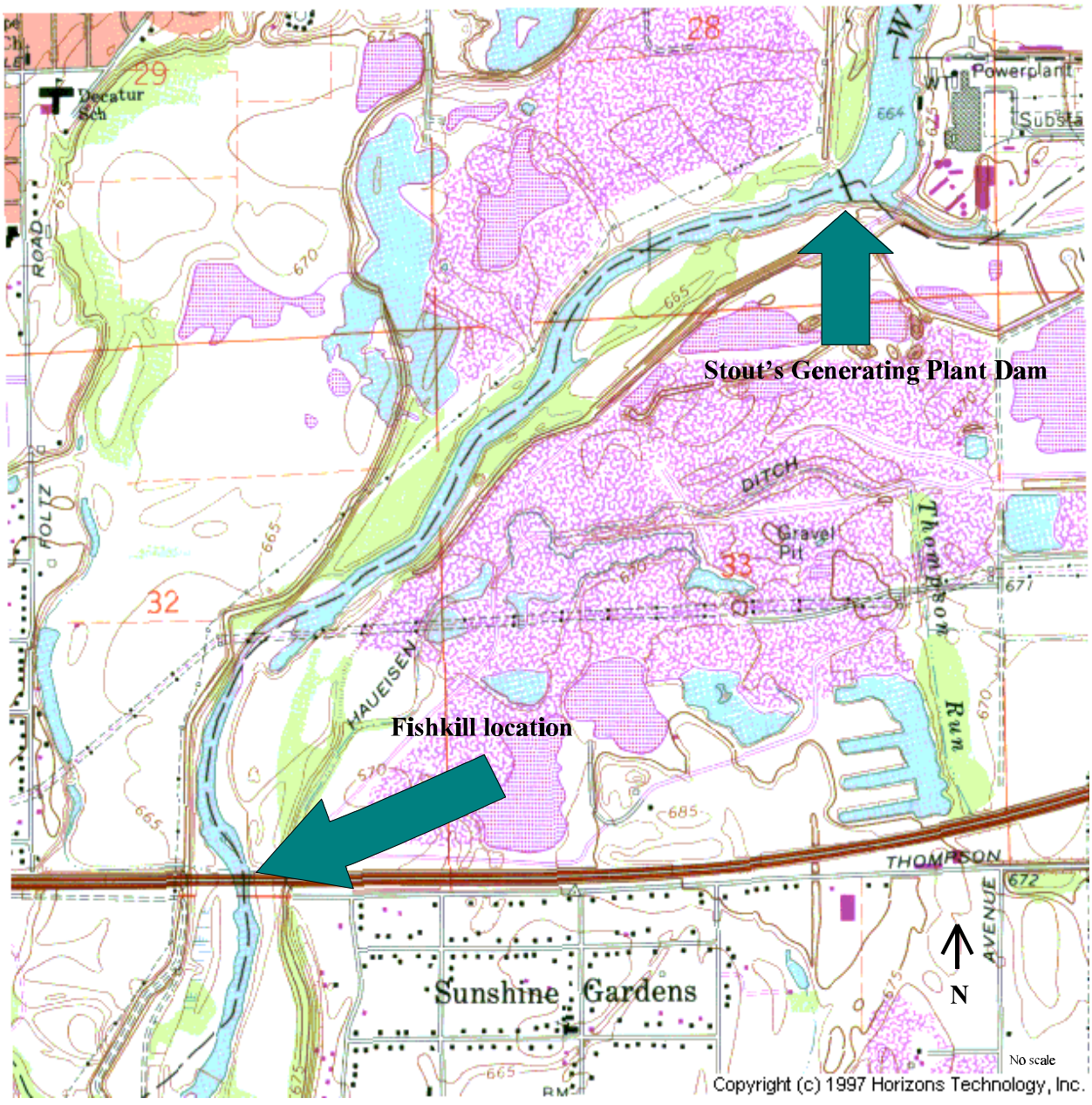

TABLE 1 Field Data of the White River Upstream, Downstream, and Within the Pool of the Fish kill at I-465 & Thompson Road Indianapolis, Indiana, on August 5, 1999.

Site #	Time	DO (mg/L)	Temp (^{o}C)	pH	Turbidity	Conductivity	TDS*	O_2 % Sat*
1	1:46 PM	8.7	24.5	7.9	12.7	931	0.596	107.0
2	1:52 PM	9.4	28.2	7.2	17.0	1300	0.834	124.0
3	2:00 PM	8.3	23.8	7.9	22.0	936	0.599	100.4
4	2:05 PM	10.35	24.3	8.0	10.0	929	0.595	125.6
5	2:07 PM	10.4	24.1	8.0	na	929	0.595	127.0

TDS= Total Dissolved Solids
O_2%Sat= Dissolved Oxygen Percent Saturation

TABLE 2 River Stage (Ft.) at 12:00 AM from two United States Geological Survey River Gaging Stations on the White River Upstream of I-465 & Thompson Road Indianapolis, Indiana, for June 31- August 5, 1999.

Gage #	31 July	1 August	2 August	3 August	4 August	5 August
1	3.22	3.15	3.09	2.92	2.9	3.1
2	2.10	2.00	1.95	1.80	1.75	1.95

Gage 1 is USGS gage 03353000 and is located 4.0 miles upstream of Stout Generating Plant.
Gage 2 is USGS gage 03353611 and is located 0.31 miles upstream of Stout Generating Plant